Buildings Technology Research and Development Subcommittee

September 21th, 2011

Location: 950 L'Enfant Plaza DOE
Time: 1:30-2:30 p.m.

Senior Principals	**Agency/Office**	
William Grosshandler	DOC/NIST	BTRD Co-chair
Roland Risser	DOE/EE-Buildings	BTRD Co-chair
Paul Domich	BTRD Ex-Sec	
Charles Iliff	AOC	
Laura Janet	CDC	
Angela Wagner	CDC	
Ab Ream	DOE	
George Hernandez	DOE	
Jerry Dion	DOE	
Joseph Hagerman	DOE	
Saralyn Bunch	DOE	
Caterina Hatcher	EPA	
Dale Manty	EPA	
Judith Heerwagen	GSA	
Kevin Kampschroer	GSA	
Kinga Porst	GSA	
Patrick Fee	GSA	
Don Meyer	GSA	
Alfred Cypress	HHS	
Jonathan Herz	HHS	
Stephen Christopher	HHS	
Greg Leifer	NIH	
Natasha Milesi-Ferretti	NIST	
Martin J. Savoie	USACE	
Teresa C. Schubert	USPS	

Next Meeting: October 13, 2011 2:00-4:00 PM, 950 L'Enfant Plaza DOE

Meeting Calendar:

October 13, 2011 November 17, 2011	December 15, 2011

Introductions: Subcommittee Co-Chair William Grosshandler (NIST) opened the monthly meeting of the Subcommittee for Buildings Technology Research and Development (BTRD) welcoming the agency representatives and thanking them for their participation. All participants provided self-introductions.

Benefits and Costs of Energy Standard Adoption in New Commercial Buildings: Joshua Kneifel (NIST) presented *Benefits and Costs of Energy Standard Adoption in New Commercial Buildings.* In this presentation Kneifel discussed a recent NIST study he conducted using life-cycle cost analysis and environmental life-cycle assessment. The analysis included extensive building cost and climate data, whole-building energy simulations, and state-level emissions and local utility rates to estimate the relative cost-effectiveness of increasing building energy efficiency and lowering the carbon footprint in new commercial buildings.

Currently, not all states have adopted the most recent model building code - some states may use earlier versions of the standard, or may not have a state-wide code. This study tries to answer three key questions:

- How much can building energy consumption, energy costs, and energy-related carbon emissions be reduced?
- Which states would benefit the most from adopting newer energy standards? Why?
- Is adopting a more efficient energy standard life-cycle cost-effective?

Four metrics area used to quantify the impact of current state of the art building codes on building performance:

(1) Energy Use
(2) Energy Costs
(3) Life-Cycle Costs
(4) Energy-Related Carbon Emissions.

The study combines the analysis for 228 separate locations in the US, applying current building code requirements (with the exception of a recently updated HVAC requirement - to be addressed), localized climate data, energy costs, and building construction materials and costs. The current analysis will be augmented to include the new HVAC requirements and possibly to incorporate local and regional compliance rates. The study uses DOE's EnergyPlus Example File Generator to create simulation data used to drive the analysis. Emission's data is drawn from EPA's eGRID program and lifecycle assessment data from NIST's Building for Environmental and Economic Stability (BEES).

The building types were categorized into 12 building types across all 228 locations and climate zones. ASHRAE Standard 90.1 was used to quantify model building code requirements over time. An additional "low energy case" was included to illustrate outcomes when requirements exceeded the current most

stringent building energy code – ASHRAE 90.1-2007.

The results of the analysis were also affected by the amount of new construction within each state – e.g., CA has larger reductions than AK as the new floor area in CA far exceeds that for AK - 72,000 m^2 vs. 1448 m^2. The percentage of energy use reduction on a state-by-state basis ranged from 0 reduction (for states using the most current energy code) to greater than a 15% reduction. Lifecycle cost savings ranged from 0 to 2.5% over the 10-year study period. (A 10-year study period was used, as it is most indicative of the duration a property is held by an owner.) Results also varied by building type and study length period.

Average percentage reductions realized for all states for the10-year study period for energy use, energy costs, and energy-related carbon emissions. The amount of new building stock will impact total savings and savings will vary significantly across locations and building types due to multiple factors.

GSA Implementing R&D Projects: Kevin Kampschroer (GSA) provided a brief overview of a new GSA program to promote the adoption of current R&D advances for high-performance green federal buildings. The October meeting will include an overview of this new GSA program.

The candidate list of targeted technologies include:

- Workstation plug loads
- Underfloor Air Distribution (UFAD) systems and HVAC
- Best practices for data centers
- Green roof technologies
- Water fixtures and flush designs for minimizing water use
- Retro and re-commissioning strategies
- Integrated building energy solutions
- Lighting controls and detection monitors
- Facade upgrades
- Geothermal solutions

The program also focuses on strategies for increasing adoption of new technologies and emerging technologies**.**

Low Cost Submetering Specification: George Hernandez (DOE) provided an update on the submetering specification effort. The low-cost submeter technical specification development began with a webinar discussion of interested stakeholders and product developers. The initial guidance was to collect performance requirements based upon the use cases of the federal government sub-metering applications. During the requirements collection phase, it became clear that no single communication solution (physical measurement of power is very well defined today) would be too difficult to specify. So, instead, the specification will utilize a performance based approach and allow the

respondents to submit creative communications solutions that will be tested in a federal building environment.

Due to the absence of testing facilities, program managers have agreed to use the DOE Forrestal Building as the test environment. Given the size and layout, the Forrestal Building represents a very challenging environment. Product developers will be asked to develop, install, and test their submeters and will be evaluated based on the established performance criteria. While the initial development plan centered on a wireless solution, the new plan is performance based - the developer is free to use any configuration of devices that successfully test in the Forrestal Building.

Submetering Information Assurance Specification: Paul Domich provided an overview of the teleconference call with PNNL and NIST subject matter experts on the issue of information assurance and development of a security specification for submeters. Marianne Swanson (NIST) is leading development of a security specification for advanced meters that is currently underway. Many of the security specifications for the advanced meters should apply as well to submetering technologies. In addition, there are a number of relevant standards, projects, and guides for data network devices including:

NISTIR 7628, "Guidelines for Smart Grid Cybersecurity":
http://csrc.nist.gov/publications/PubsNISTIRs.html

NIST SP 800-37, "Guide for Applying the Risk Management Framework to Federal Information Systems":
http://csrc.nist.gov/publications/nistpubs/800-37-rev1/sp800-37-rev1-final.pdf

NIST SP 800-53, "Recommended Security Controls for Federal Information Systems and Organizations":
http://csrc.nist.gov/publications/nistpubs/800-53-Rev3/sp800-53-rev3-final_updated-errata_05-01-2010.pdf

Advanced Security Acceleration Project (ASAP-SG), "Security Profile for Advanced Metering Infrastructure":
http://osgug.ucaiug.org/utilisec/amisec/Shared%20Documents/AMI%20Security%20Profile%20(ASAP-SG)/AMI%20Security%20Profile%20-%20v2_0.pdf

Marianne welcomed future PNNL/DOE participation in the AMI standards and planning efforts including the Smart Grid Interoperability Panel - Cyber Security Working Group (SGIP-CSWG) and the Advanced Metering Infrastructure Security Subgroup. For more information, please see:
http://collaborate.nist.gov/twikisggrid/bin/view/SmartGrid/CsCTGAMI.

Behavioral Issues: The task group for behavioral issues convened via conference calls. The group is focusing on evidence-based approaches for

persistent behavioral modification and strategies for changing institutional culture. Jerry Dion (DOE/FEMP) provided an overview of the FEMP program focused on factors that change institutional rules and culture that can result in widespread and persistent behavioral change of occupants.

Commissioning: Ab Ream (DOE/FEMP) summarized the FEMP O&M meeting held on September 20. Paul Domich (BTRD) presented to the FEMP group on the BTRD commissioning priority task effort. The FEMP O&M Group seeking to create a baseline for commissioning activities in federal facilities. A survey is under development that will be determine what type of commissioning activities that are being performed, their focus and scope, what is working, and the differing perspectives on approaching the commissioning issue.

As evidenced in prior work, energy audits and commissioning generally focus on 5 or 6 reoccurring issues. These commonly occurring issues represent a starting point for federal agencies undertaking commissioning activities. The challenge is to institutionalize the commissioning activities as a component of standard occurring activities rather than discrete /periodic events.

Whole Building/Campus Retrofits: Whole Building/Campus Retrofits: Marty Savoie (USACE) described the task area as focusing on best practices, tools, and procurement approaches. The goal is to identify the effectiveness of whole-building and campus-wide strategies for commissioning and recommissioning, whole HVAC upgrades, lighting replacement, and associated issues related to clusters of buildings.

DOD has a number of programs underway in the areas of whole-building/campus retrofits. The U.S. Army has an effort underway to develop net-zero installations. One of the challenges is related to modeling energy systems for clusters of buildings and installations. The Army's project has been accepted for funding and will begin with an integrated design/analysis for energy, water, waste production, and installation requirements. The Army's goal is to have twenty installations achieving to NZ by 2020 and 6-Netzero for energy, 6-Netzero for water, and 6-Netzero for waste, and 2-Netzero for energy/water/waste.

The Army also has a project looking retrofitting envelop/HVAC systems for barracks. Barracks at Ft. Polk had retrofits for the building envelop that allow for a continuous air barrier to control air leakage into, or out of, the building to reduce sensible and latent energy loads. Air infiltration rates during commissioning were measured as low as 0.10 SCFM/SF. HVAC was retrofitted with a dedicated outdoor air systems for provide a high level of indoor humidity control.

The U.S. Navy is also undertaking a whole-building retrofit under the Greater Philadelphia Innovation Cluster (GPIC). The GPIC is a consortium of academic institutions, federal laboratories, global industry partners, regional economic

development agencies and other stakeholders. As part of this effort, Building 661 at The Navy Yard will undergo a full-spectrum retrofit. A new, advanced integrated building sciences laboratory will also be constructed. These two buildings will house GPIC personnel and will function as living laboratories - from design through construction, commissioning and operation - for developing the tools, methods and policies necessary to transform the building industry into a model of energy independence, operating efficiency and economic sustainability.

Finally, the Tri-Services Technology Panel is looking to transition military research at the 6.2 and 6.3 levels into products and standards, focusing initially on energy technologies.